

UNIVERSITY OF TECHNOLOGY SYDNEY

DOCTORAL THESIS

**Animal Spirits and Financial Instability
- a disequilibrium macroeconomic
perspective**

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Declaration of Authorship

I, Tianhao ZHI, declare that this thesis titled, 'Animal Spirits and Financial Instability - a disequilibrium macroeconomic perspective' and the work presented in it are my own. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University.
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

Signed:

Date:

*“Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than mathematical expectations, whether moral or hedonistic or economic. Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as the result of **animal spirits**—a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities.”*

- John Maynard Keynes

“There are two basic motivating forces: fear and love. When we are afraid, we pull back from life. When we are in love, we open to all that life has to offer with passion, excitement, and acceptance.”

- John Lennon

*“**Stability leads to instability.** The more stable things become and the longer things are stable, the more unstable they will be when the crisis hits.”*

- Hyman Minsky

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Abstract

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Doctor of Philosophy

**Animal Spirits and Financial Instability - a disequilibrium macroeconomic
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by Tianhao ZHI

This thesis aims to develop a set of dynamic models that *(i)* systematically investigate the fiscal/credit-driven monetary dynamics under an alternative quantitative framework and *(ii)* analyze how bounded rationality of credit-creating financial institutions induces credit cycles and propagates macroeconomic instability.

Chapter 2 surveys the literature of Keynesian disequilibrium macroeconomics by examining the relationship between the origin of disequilibrium macroeconomic thinking and the development of disequilibrium macroeconomic models. Keynes alludes to the idea of disequilibrium macroeconomics in his *General Theory*. It has inspired the ongoing development of disequilibrium macroeconomic literature that strives to formalize Keynes's disequilibrium thinking with the use of advanced tools in nonlinear dynamic systems. We discuss two particular strands of modelling approaches: the Keynes-Metzler-Goodwin approach and the Weidlich-Haag-Lux approach.

Chapter 3 takes a critical look at the “Modern Money Theory” (*a.k.a Neo-Chartalism*) from a dynamic perspective. In this chapter, we propose a set of dynamic models that aim to investigate the monetary dynamics as well as its real and inflationary consequences. We contend that some of the MMT's claims are questionable due to a general lack of formal quantitative analysis that justifies and measures its policy effects and consequences, especially the long run inflationary consequence of the fiscal/credit-driven monetary expansion. This chapter also provides a modelling framework that is further adopted in the subsequent two chapters of the thesis.

Chapter 4-5 systematically construct the CDGZ model that aims to examine *(i)* how bounded rationality and heterogeneity in the banking sector induces credit cycles due to “animal spirits”-driven bounded rationality of financial institutions and how it propagates macroeconomic instability and *(ii)* the dynamics of interbank market over the course of credit cycles. The idea of “animal spirits” has been widely treated in the literature with particular reference to investment in the productive sector. Chapter 4 takes a different view and analyses from a theoretical perspective the role of banks' collective behaviour in the creation of credit that, ultimately, drives the credit cycles. We further investigate the mechanisms of interbank market in chapter 5. The policy implications regarding UMP as well as Tobin-type tax are thoroughly discussed. The analytical as well as numerical simulations of the final 8D CDGZ model may potentially be useful in providing relevant policy recommendations.

Acknowledgements

This thesis sums up my academic and life's journey in the last four years. While studying and writing about the manias, panics and crashes of the world economy, I have simultaneously experienced a boom-bust cycle in my own personal life. Here I would like to express my sincere gratitude to a number of people without whom this tumultuous journey would never reach its final destination.

My boom period had started from the initial two and a half years since the commencement of my PhD journey in 2012, when the U.S. and Europe were busy dealing with their mess in the financial system and Hollywood had just dramatized the end of the world earlier on. I developed a keen interest in Agent-Based Model and Keynesian economics while teaching at University of Queensland. I was lucky enough to meet my former principle supervisor Prof. Carl Chiarella who offered me the opportunity to do my PhD here at UTS. He gives me not only an excellent academic guidance, but also supports me to travel to various international conferences and present my work. Working under his supervision I enjoyed the freedom to pursue my own research interest. He is a great mentor to me and gives me pivotal guidance throughout my graduate studies. I am also grateful for the academic support from my co-supervisor Tony Xue-Zhong He. I am thankful to UTS Graduate Research School (GRS) and Business Faculty for the generous financial support in the first three and a half years, which covers not only my tuition fee and living stipend during this period, but also allows me to travel to various international conferences through numerous travel grants. I am grateful for Ms Stephanie Ough for her wonderful job in helping me with the administrative work. I am thankful to the presence and companion of my fellow PhD students in our mutual journey. I am grateful for my former mentor Dr. Frederique Bracoud at University of Queensland who had ignited my initial interest into the field of banking theory and financial economics, which leads to the ongoing development of this thesis.

My bust period had started from the late 2014. While the world economy was still in depression and Greece was on the brink of a colossal economic collapse, I started to experience an onset of severe depression due to unforeseen life's circumstances. For a period of time I was unable to fulfill my research work and every simple task of daily life seemed to be a great struggle. My future was clouded with dreadful instability and radical uncertainty. Yet, during this very dark period of my life when I nearly decided to give up my PhD (and almost everything), I received so much help from UTS counselling service, RPA hospital, as well as members of Central Baptist Church in my battle against depression. I have eventually triumphed over the demon and regained my unconditional love for life. I would like to mention in particular Susan Colbert, Matthew Abdelahad, and Nathaniel Kong from CBC for their love and kindness. I am grateful for many

alternative therapists whom I have met in Sydney. I am grateful for my friend Sara Angela Senn for her continuous emotional support. I am grateful for many friends I had encountered at my local pub Friend-In-Hand¹ in Glebe who cared about me during my emotional struggle. I am grateful for the ongoing financial and emotional support from my family. I am also grateful for the academic support and encouragement from our PhD coordinator Dr. Christina Nikitopoulos. I am thankful for the wonderful proofreading work by Heath Henn. I am greatly inspired by my friend Wanting Xiong whom I met in 2014 INET plenary conference in Toronto, Canada. Her passion in economics and her establishment of New Economic Reading Group has not only helped many like-minded students to study economics from an alternative perspective, but also revived my interest in pursuing my study through participation of reading groups. Most importantly, it is the immense patience and guidance of my current principal supervisor Dr. Corrado Di Guilmi who gives me tremendous courage to finish the last part of my thesis. He is truly a wonderful mentor and it is a great honour to complete this journey through his guidance. To him I dedicate this thesis.

I have learnt the insight of Keynes' idea through my academic studies as well as through my own life's struggle, which is reminiscent of what Keynes elaborates in his *General Theory*: "*most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as the result of **animal spirits***". I have come to the realization through reading Hyman Minsky as well as through my own relationship struggles that stability is intrinsically unstable. It is vital to take unconventional action or policy intervention during unconventional times. However, it will not work out if the economy is structurally broken, and the "animal spirits" of individuals is not revived to a state of optimism from pessimism. The looming instability and radical uncertainty still prevails in our daily life. Yet a state of optimism and love is the only light that guides us through the dark tunnel of financial instability and radical uncertainty.

¹The acronym of this pub has always reminded me of one major theme in my thesis, i.e. Minsky's Financial Instability Hypothesis.

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Abbreviations

BG	B eja G oldman
DSGD	D ynamic S tochastic G eneral D isequilibrium
DSGE	D ynamic S tochastic G eneral E quilibrium
FIH	F inancial I nstability H ypothesis
GFC	G lobal F inancial C risis
HAM	H eterogeneous A gent M odel
HPM	H igh P owered M oney
KMG	K eynes M etzler G oodwin
MMT	M odern M onety T heory
ODE	O rdinary D ifferential E quation
OMO	O pen M arket O peration
QE	Q uantitative E asing
UMP	U nconventional M onetary P olicy
WHL	W eidlich H aag L ux

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